clinical efficacy of this system.[3,4] In the last 3 years, we treated 15 patients with ECMO and CRRT. In contrast to the setup suggested by the authors, we connected the filter inlet of the CRRT machine after the ECMO pump, and the filter outlet was then returned to the ECMO circuit before the pump (into the reservoir, if present): The CRRT circuit, running counter-current to extracorporeal assistance, allows the blood to be infused into the venous ECMO section (where the patient is drained) and then to be aspired from the arterial ECMO section (where blood returns to the patient) (Figure 1). In our opinion, there are several reasons to prefer this setup. First, ECMO connection lines are generally used for circuit pressure monitorization, and frequently one connection in the ECMO venous line and one in the arterial line remain available. Second, this might reduce blood flow resistance and turbulence after the centrifugal pump and improve reservoir drainage when a roller pump is present. Blood recirculation induced by this circuit setup is negligible, considering that the CRRT to ECMO blood flow ratio is never >0.1. The only requirement to take into consideration during roller extracorporeal assistance is to increase ECMO blood flow by the same amount as CRRT blood flow, to compensate the shunted circulation. Interestingly, during centrifugal ECMO, the flow is self-adjusted to the increased value, considering the additional pre-pump blood flow coming from the CRRT circuit and reduced resistances after the centrifuge due to blood aspiration into the dialysis machine.

1. Santiago MJ, Sánchez A, López-Herce J *et al.* The use of continuous renal replacement therapy in series with extracorporeal membrane oxygenation. *Kidney Int* 2009; **76**: 1289–1292.
2. Ricci Z, Polito A, Giorni C *et al.* Continuous hemofiltration dose calculation in a newborn patient with congenital heart disease and preoperative renal failure. *Int J Artif Organs* 2007; **30**: 258–261.
3. Ricci Z, Morelli S, Vitale V *et al.* Management of fluid balance in continuous renal replacement therapy: technical evaluation in the pediatric setting. *Int J Artif Organs* 2007; **30**: 896–901.
4. Ricci Z, Carotti A, Parisi F *et al.* Extracorporeal membrane oxygenation and high-dose continuous veno-venous hemodiafiltration in a young child as a successful bridge to heart transplant for management of combined heart and kidney failure: a case report. *Blood Purif* 2009; **29**: 23–26.

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The Authors Reply: After having read Dr Ricci *et al.*'s[1] comments about our article,[2] we would like to add some considerations.

The papers published by these authors are single-case descriptions that basically refer to the working of the continuous renal replacement therapy (CRRT). In these papers no assessment of CRRT and extracorporeal membrane oxygenation (ECMO) working in-line was carried out.[3,4] On the contrary, our study evaluates these characteristics *in vitro*, in an animal model as well as in children, through a clinical prospective study.[2]

Similar to our model, Ricci *et al.* connect the filter inlet of the CRRT machine after the ECMO pump, but the filter outlet is returned to the ECMO circuit before the pump (into the reservoir, if present). The authors suggest that this type of connection may have some advantages:

(1) One connection in the ECMO venous line and one in the arterial line are available. However, this depends on the type of ECMO circuit used. In our type of circuit, the CRRT device is connected through a three-way luer lock connection that allows measurement of the pressure and the infusion of heparin simultaneously in the same line. This also makes the connection and withdrawal of the circuit easy at any time without causing any alteration in the ECMO function.

(2) This might also reduce blood flow resistance and turbulence after the centrifugal pump and improve reservoir drainage when a roller pump is present. We are not aware of any study having measured the turbulence and resistance to blood flow or suction pressures in the reservoir after the connection of the CRRT to the ECMO circuit, but the effect is likely to be minimum because, as the authors say, the CRRT to ECMO blood flow ratio is never greater than 0.1.

So, what disadvantages might the connection that Dr Ricci *et al.* propose have? As the ECMO pump exerts a negative pressure in the reservoir and/or the circuit, which could be transmitted to the CRRT device and could cause errors in the outlet pressure, as well as decrease in the filter pressure and transmembrane pressure, important information regarding the state of the filter could be lost.

In conclusion, connecting the CRRT device to the ECMO circuit improves the handling of the CRRT device. Probably there is no unique method to connect these devices, and each institution must assess and decide on which method to adopt depending on the circuit and machine they use.

1. Ricci Z, Ronco C, Picardo S. CRRT in series with extracorporeal membrane oxygenation in pediatric patients. *Kid Int* 2010; **77**: 469–470.
2. Santiago MJ, Sánchez A, López-Herce J *et al.* The use of continuous renal replacement therapy in series with extracorporeal membrane oxygenation. *Kidney Int* 2009; **76**: 1289–1292.
3. Ricci Z, Polito A, Giorni C *et al.* Continuous hemofiltration dose calculation in a newborn patient with congenital heart disease and preoperative renal failure. *Int J Artif Organs* 2007; **30**: 258–261.
4. Ricci Z, Morelli S, Vitale V *et al.* Management of fluid balance in continuous renal replacement therapy: technical evaluation in the pediatric setting. *Int J Artif Organs* 2007; **30**: 896–901.

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Nephroprotective drugs from traditionally used Aboriginal medicinal plants

To the Editor: The recent article by Farese *et al.*[1] sheds light on a very important source area of drug development, medicinal plants. People in different cultures, all over the world, have used medicinal plants for a number of diseases. One such traditional medicine system is that of the Canadian Aboriginals. This system has been practiced for centuries and encompasses treating the whole person through mind, body, and spirit. Medicinal plants make up the most important tool in curing a disease. Table 1 lists selected plants used by Aboriginal tribes all over Canada for kidney diseases. Mostly, these are used for diuresis, renal stones and cleansing the kidneys. Plants have also been a major source of new drugs since the inception of modern pharmacology.[2] According to a survey, one-third of all the newly approved compounds are derived from plants.[2] A brief review of the literature shows different plants being effective in preventing/treating renal diseases either in animal models or in clinical trials.[3,4] Some renal conditions reported to respond to plant therapy are glomerulonephritis, IgA nephropathy, membranous nephropathy, glomerulosclerosis, immune complex nephritis, nephrotic syndrome, lupus, tubulointerstitial nephritis, chronic allograft nephropathy, kidney stones, etc.[3,4] Some pharmacological characteristics seen in plants that may contribute in the above-mentioned conditions are antiinflammation; antioxidation; diuresis; immunomodulation; prevention of acute allograft rejection and drug-induced nephrotoxicity; reduction in proteinuria, renal interstitial fibrosis, renal ischemia/reperfusion injury, tubular and mesangial cell proliferation, blood lipid levels, blood pressure, lipid peroxidation, apoptosis, renal necrosis, and calcium oxalate crystal aggregation; and stimulation of renal repair mechanisms, RNA and protein synthesis.[3,4] Continued efforts are required to identify and develop traditionally used medicinal plants in renal diseases so that more effective treatments are available from plants that have been known for their efficacy for hundreds of years.

1. Farese S, Kruse A, Pasch A *et al.* Glycyrrhetinic acid food supplementation lowers serum potassium concentration in chronic hemodialysis patients. *Kidney Int* 2009; **76**: 877–884.
2. Ghayur MN. Role of medicinal plants and their constituents in the understanding and evolution of pharmacology and the autonomic nervous system. In: Govil JN, Singh VK (eds). *Recent Progress in Medicinal*

Table 1 | List of selected Aboriginal medicinal plants traditionally used in kidney diseases

Scientific name	Common name (plant type)	Family	Part used	Traditional use (preparation)	Habitat (tribe)
Acer pensylvanicum	Striped maple (tree)	Aceraceae	Bark	Diuretic (bark tea)	NB, NS, PE, QC, ON (Penobscot, Micmac)
Arctostaphylos uva-ursi	Bearberry (shrub)	Ericaceae	Leaf	Diuretic (tea of leaves)	All of Canada (Algonquin, Blackfoot, Micmac, Salish)
Cornus canadensis	Bunchberry (herb)	Cornaceae	Whole plant	Kidney problems (drinking steeped plant)	All of Canada (Micmac)
Cucurbita sp.	Squash (vine)	Cucurbitaceae	Seed	Diuretic (chewing seeds, seeds pulverized and taken with water)	ON, QC (Chippewa, Plains Indians)
Juniperus cummunis	Juniper (tree)	Cupressaceae	Twig, berry	Kidney problems (twig and berry tea)	All of Canada (Gitxsan, Blackfoot, Micmac, Cree)
Epigaea repens	Trailing arbutus (shrub)	Ericaceaae	Leaf	Kidney stones (infusion of leaves)	Southern Canada (Algonquin, Iroquois)
Larix laricina	Tamarack (tree)	Pinaceae	Gum	Kidney problems (chewing of gum)	BC, ON, QC, Atlantic Canada (Cree, Ojibwe, Chippewa)
Ledum groenlandicum	Labrador tea (Shrub)	Ericaceae	Leaf	Kidney problems (leaves infusion)	All of Canada (Cree, Micmac)
Medeola virginiana	Cucumber root (herb)	Liliaceae	Crushed dried berry and leaf, root	Diuretic (berry and leaf infusion; chewing root)	NS, NB, QC (Iroquois)
Pinus strobus	White pine (tree)	Pinaceae	Bark, needle, twig	Kidney and urinary problems (tea of plant parts)	Atlantic Canada, QC, ON, MB (Algonquin, Iroquois, Ojibwe, Micmac)
Sarracenia purpurea	Purple pitcher plant (herb)	Sarraceniaceae	Root	Kidney problems (drinking steeped root)	Southern Canada (Micmac)

Abbreviations: BC, British Columbia; MB, Manitoba; NB, New Brunswick; NS, Nova Scotia; ON, Ontario; PE, Prince Edward Island; QC, Quebec.